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Abstract

GRAPHITE REACTOR PHYSICS

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The study of graphite-natural uranium power reactor physics, undertaken ten years ago when the Marcoule piles were built, has continued to keep in step with the development of this type of pile.

From 1960 onwards the critical facility MARIUS has been available for a systematic study of the properties of lattices as a function of their pitch, of fuel geometry and of the diameter of cooling channels. This study has covered a very wide field : lattice pitch varying from 19 to 38 cm, uranium rods and tubes of cross - sections from 6 to 35 cm^2, channels with diameters between 70 and 140 mm. The lattice calculation methods could thus be checked and where necessary adapted.

The running of the Marcoule piles and the experiments carried out

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on them during the last few years have supplied valuable information on the overall evolution of the neutronic properties of the fuel as a function of irradiation. More detailed experiments have also been performed in Marius with plutonium-containing fuels (irradiated or synthetic fuels), and will be undertaken at the beginning of 1965 at high temperature in the critical facility CESAR, which is just being completed at Cadarache.

Spent fuel analyses complement these results and help in their interpretation. The thermalisation and spectra theories developed in France can thus be verified over the whole valid temperature range.

The efficiency of control rods as a function of their dimensions, the materials of which they are made and the lattices surrounding them has been measured in Marius, and the results compared with calculation on the one hand and with the measurements carried out in EDF 1 on the other. Studies on the control proper of graphite piles were concerned essentially with the risks of spatial instability and the means of detecting and controlling them, and with flux distortions caused by the control rods.